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(71) Applicant(s)
Telia AB

(Incorporated in Sweden)

Mårbackagatan 11, S-123 86 FARSTA, Sweden

(72) Inventor(s)
Stefan Lidbrink

(74) Agent and/or Address for Service

Ronald Nicholson

N&M Consultancy Limited, 4 Pine Grove,
BISHOP'S STORTFORD, Herts, CM23 5NP,
United Kingdom

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(54) An analogue mobile telephone system

(57) On establishing communication, the mobile telephone system requests a password from the caller. The caller then transfers a spoken password to the system. The system receives the password in speech recognition equipment which identifies the received speech. After identification, the password is checked against a password stored in advance. If these passwords agree, a signal is transferred to a home location register which in turn transfers a signal to the mobile telephone system that the call is allowed. The home location register can also transfer to the mobile telephone system regarding limitations in the rights of the telephoning party to communicate with other subscribers in the mobile telephone system or to telephone systems and/or services connected to the mobile telephone system.

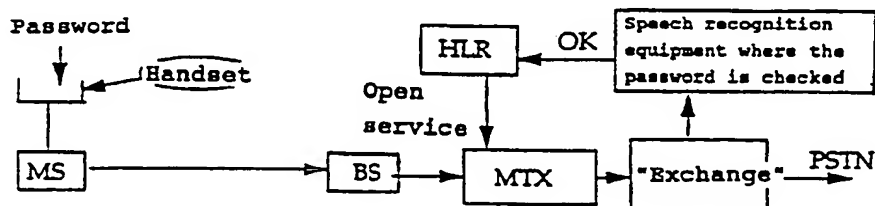


Fig 1

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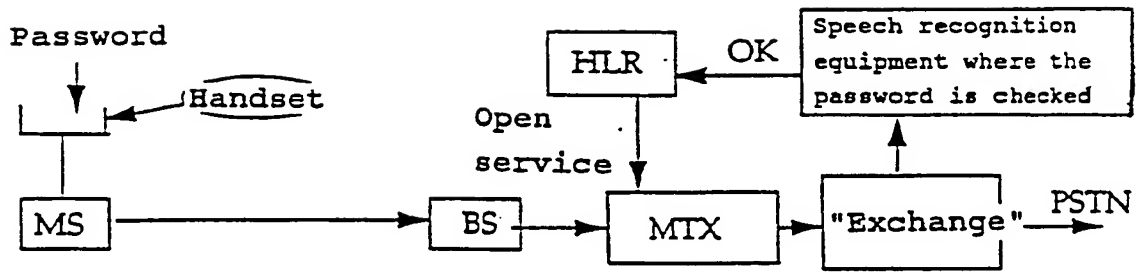


fig 1

AN ANALOGUE MOBILE TELEPHONE SYSTEM

5 The present invention relates to an analogue mobile telephone system and, in particular, an arrangement and method for the authentication of a user of the mobile telephone system.

10 Authentication systems are known and are used in many different ways in telephony. For example, banks use numerical codes which are transferred with the aid of tone signals. It is also known to utilise other tone signals which are transmitted from an equipment system. The transmission of information between a transmitter and a receiver by utilising, for example, smart cards, is also known. When smart cards are used, a communication is established between the smart card and an equipment which is adapted to authenticate the user. In addition to authentication by smart cards, a password can also be requested from the user.

20 In older mobile telephone systems, for example NMT (Nordic Mobile Telephone System), the incidence of fraud is on the increase. In the USA, for example, it is estimated that fraud, in some form, amounts to approximately 10 % of turnover. The main reason why these older analogue systems are more exposed to fraud, than the more modern systems, is that the designs/specifications for the older analogue mobile telephone systems were established well before the problems associated with fraud ever arose.

30 The older analogue mobile telephone systems frequently use the telephone number of the mobile telephone for identifying the person who wishes to make a call. In this case, the mobile telephone exchange uses the transmitted

telephone number. When analogue mobile telephone systems were introduced, this did not constitute a problem. However, due to advanced technical developments in this field, it is now possible for users to reprogramme their own telephone and to monitor the figures which are sent
5 between a mobile telephone and an exchange.

It is, therefore, possible for less scrupulous persons to reprogramme a telephone to another telephone number. Calls which are then established from the reprogrammed
10 telephone will be debited to the customer who has the subscription and whose telephone number the swindler is using. The subscriber who is debited for these fraudulent calls which he/she will undoubtedly refuse to acknowledge, will very probably have disputes with the network operator.
15 The subscriber will not be prepared to pay for the fraudulent calls and, at the same time, the network operator will not want to lose the related income. The network operator must also take into account the fact that dissatisfied subscribers can elect to leave the system,
20 i.e. cancel his/her subscription, if suitable compromises cannot be found to the problem. Furthermore, reliable measures must be introduced into the network to eliminate the problems which have arisen. The risk of subscribers leaving the older systems, because of these problems, is obviously something that a network operator must consider.
25 Also, the subscribers who elect to leave the older systems because of these problems may be seized with doubts regarding the newer systems. The effect of this is that existing customers could be lost forever, or at least for
30 a long time. In addition, a bad reputation for older mobile telephone systems may give rise to a bad reputation for the newer mobile telephone systems because, in many cases, the customers do not recognise, and/or understand,

the differences between the different mobile telephone systems.

5 The invention provides an authentication arrangement for an analogue mobile telephone system comprising mobile stations, base stations and control units for establishing communication between a person who utilises a mobile station and a receiving subscriber, characterised in that, the arrangement includes request means for requesting, on setting-up the communication, a verbal password from said person utilising the mobile station, speech recognition means for receiving and checking the verbal password, and transmission means for transmitting, on receipt of a correct password by the speech recognition means, a signal to a home location register, and in that the home location register, on receipt of the signal from the transmission means, arranges for the communication to be established between the said person and the receiving subscriber.

20 The speech recognition means preferably include a store for storing the said person's current password and comparison means for comparing the verbally transmitted password with the stored password, the transmission of the said signal to the home location register being effected on authentication of the password of the said person.

25 The speech recognition means may be adapted to recognise the voice of the said person.

30 In a preferred arrangement, the home location register is adapted to inform the mobile telephone system of any limitations in the rights of the said person to establish communication with other persons. These limitations include non-availability of selected routing number zones,

and/or international telephony.

The invention also provides an analogue mobile telephone system including an authentication arrangement as outlined in any of the preceding paragraphs.

5 The invention further provides an authentication method for an analogue mobile telephone system comprising mobile stations, base stations and control units for establishing communication between a person who utilises the mobile station and a receiving subscriber,
10 characterised in that, the method includes the steps of receiving a verbal password from the said person utilising the mobile station, authenticating the verbal password and, on receipt of an authenticated password from the said person, allowing the said person to establish communication
15 with the receiving subscriber.

 The method preferably includes the steps of switching a call from a mobile station to speech recognition means, causing a connection to be established between the speech recognition means and the mobile station, the speech
20 recognition means establishing verbal contact with, and requesting a password from, the person making the call and, on receipt of the verbally transmitted password from the said person, comparing the password with a stored password for the said person, authentication of the password
25 allowing the said person continued communication.

 The switching of the call to the speech recognition means can be effected on initiation of a call from the mobile station, or when certain predetermined services are selected by the person making the call from the mobile
30 station, in which case, the method includes the step of

storing the numbers sent out from the mobile telephone of the person making the call pending authentication of the password of the calling person. The predetermined services may include certain routing zones and/or international telephony.

The connection of a mobile station to the speech recognition means may only be effected when the person making a call from a mobile station requires the use of certain predetermined functions in the network, in which case, the method includes the step of establishing contact between the mobile station and the speech recognition means utilising a special directory number.

The method may also include the step of authenticating the number of the mobile station as well as the verbally transmitted password from the person making the call.

The invention further provides an analogue mobile telephone system comprising mobile stations, base stations and control units for establishing communication between a person who utilises the mobile station and a receiving subscriber, characterised in that, authentication of said person is effected by the method according to the present invention.

Thus, in accordance with the present invention, an analogue mobile telephone system includes mobile stations, base stations and control units, and means are provided for authenticating the identity of a person, i.e. a calling subscriber of the system, who is utilising a mobile station to establish a communication with a receiving subscriber who may be located in the mobile telephone system, or in a telephone system connected to the mobile telephone system.

The authentication must be effected before establishing a connection with the receiving subscriber. When the calling subscriber requests connection to the mobile telephone system via his base station, the mobile telephone system requests a password from the subscriber in question. The subscriber gives the password verbally. The password is received by speech recognition equipment which is arranged in the mobile station. The speech recognition equipment which is trained to recognize the current password, checks if the correct password has been received. If the right password is received, a signal is transmitted to the home location register. The home location register, on receipt of the transmitted signal, arranges for the communication to be established between the calling subscriber and the receiving subscriber

In accordance with one aspect of the present invention, an increased security check is provided by arranging for the speech recognition equipment to be trained to the voice of the subscriber.

In a further aspect of the present invention, the home location register informs the mobile telephone system of any limitations in the rights of the subscriber to establish communication with other persons. This may mean, for example, that international telephony is not allowed, or that certain telephone numbers are blocked.

Thus, in accordance with the present invention, increased security can be provided for older analogue mobile telephone systems. This means that the risk of frauds can be significantly reduced. The risk of false programming is greatly reduced through the invention. The possibility of monitoring and utilising codes which are

transmitted through the air is also minimized. Due to the fact that the invention permits a simple exchange of passwords, the risk of unauthorized utilisation of the latter is minimized. In the case of some unauthorized person misappropriating the password, it is also simple to quickly change the password.

Also, the transfer a verbal word is much simpler than typing in a figure combination on the push buttons, or the like, on the subscriber's telephone. Furthermore, when use is being made of the telephone whilst driving a car, the transfer of a verbal password gives rise to increased safety.

The foregoing and other features according to the present invention will be better understood from the following description with reference to the single figure of the accompanying drawings which illustrates, in the form of a block diagram, an analogue mobile telephone system according to the present invention.

With an analogue mobile telephone system (see the single figure of the accompanying drawings), when a person intends to establish communication with another person over the mobile telephone system, the person establishing the call will activate his/her mobile station, MS. The mobile station, MS, transmits signals, in a manner known to persons skilled in the art, to a base station, BS, which is connected to the mobile telephone exchange, MTX. The base station, BS, receives the signals and activates the switching functions of the mobile telephone exchange, MTX.

In one embodiment of the present invention, as illustrated in the single figure of the accompanying

drawings, a connection is made, via the mobile station, MS, utilising a telephone handset, directly to speech recognition equipment. The speech recognition equipment establishes verbal contact with the person calling. On
5 establishment of contact, the speech recognition equipment requests a password from the person making the call. On receipt of the request, the person making the call gives the password. The speech recognition equipment analyses the verbally transmitted password by comparing it with a
10 password stored in the speech recognition equipment. If the password is identified as corresponding to the stored password, it is approved by the speech recognition equipment. After approval has been effected, a signal is transmitted from the speech recognition equipment to a home
15 location register, HLR. The home location register transfers a signal to the mobile telephone exchange, MTX, which indicates that the person is approved for further telephoning.

In another embodiment of the present invention, the
20 switching of the call to the speech recognition equipment is only effected when certain predetermined services are selected. This can, for example, relate to certain routing number zones, or international telephony. When the subscriber initiates these functions, by dialling on
25 his/her mobile telephone, the mobile telephone exchange, MTX, switches the call over to the speech recognition equipment. The numbers which are sent out from the mobile telephone subscriber are stored in the mobile telephone exchange, MTX, while waiting for the speech recognition
30 equipment to identify the caller. As outlined above, the speech recognition equipment requests a verbal password from the caller. Recognition is carried out, in the manner outlined above, after which an approval signal is

transferred to the home location register, HLR. The home location register, HLR, then transmits a signal to the mobile telephone system that the requested communication should be established. The mobile telephone system then
5 arranges the setting up of the call to the requested subscriber, or service.

In a further embodiment of the present invention, the person with a mobile station calls the speech recognition equipment via a special directory number. With this
10 arrangement, connection to the speech recognition equipment is only intended to be effected in those cases where it is wished to utilise certain predetermined functions in the network. Thus, with this arrangement, the predetermined functions could, for example, be certain preprogrammed
15 subscriber numbers, or services, that would be stored in the system. After the password checks have been effected, in the manner outlined above, a signal is transferred back to the home location register, HLR, which specifies that the selected functions can be utilised. The home location
20 register, HLR, transfers the information to the mobile telephone system which registers what is allowed. In a variant of the invention, it is also possible for the home location register, HLR, to transfer information to the mobile telephone system relating to the subscriber number
25 to which the mobile station should be switched.

In a further embodiment of the present invention, the mobile telephone system also receives information relating to the desired subscriber number in addition to the speech recognition function. In this case, the subscriber number
30 is transferred to the home location register, HLR, which, after checking the verbal password of the subscriber, also checks the requested subscriber number. The approved

subscriber number is then transferred to the mobile telephone system which carries out the requested setting-up of the call.

5 The speech recognition equipment can be arranged in different ways, depending on the nature of the security arrangements required for the analogue mobile telephone system. In a first variant, the speech recognition equipment is trained to recognize the password from anybody. If a greater security level is aimed at, the
10 speech recognition equipment is trained to recognize the password only from a person, or persons, authorized to utilise the system.

15 It will be directly evident to persons skilled in the art that the invention is not limited to the illustrated and described embodiments but could be realised in many different ways within the scope of the patent claims and the basic inventive concepts.

CLAIMS

1. An authentication arrangement for an analogue mobile telephone system comprising mobile stations, base stations and control units for establishing communication between a person who utilises a mobile station and a receiving subscriber, characterised in that, the arrangement includes request means for requesting, on setting-up the communication, a verbal password from said person utilising the mobile station, speech recognition means for receiving and checking the verbal password, and transmission means for transmitting, on receipt of a correct password by the speech recognition means, a signal to a home location register, and in that the home location register, on receipt of the signal from the transmission means, arranges for the communication to be established between the said person and the receiving subscriber.

2. An arrangement as claimed in claim 1, characterised in that, the speech recognition means include a store for storing the said person's current password, and comparison means for comparing the verbally transmitted password with the stored password, the transmission of the said signal to the home location register being effected on authentication of the password of the said person.

3. An arrangement as claimed in claim 1, or claim 2, characterised in that the speech recognition means are adapted to recognise the voice of the said person.

4. An arrangement as claimed in claim 1, characterised in that, the home location register is adapted to inform the mobile telephone system of any limitations in the rights of

the said person to establish communication with other persons.

5 5. An arrangement as claimed in claim 4, characterised in that, the limitations include non-availability of selected routing number zones, and/or international telephony.

6. An authentication arrangement for an analogue mobile telephone system substantially as hereinbefore described with reference to the single figure of the accompanying drawings.

10 7. An analogue mobile telephone system including an authentication arrangement as claimed in any one of the preceding claims.

15 8. An authentication method for an analogue mobile telephone system comprising mobile stations, base stations and control units for establishing communication between a person who utilises the mobile station and a receiving subscriber, characterised in that, the method includes the steps of receiving a verbal password from the said person utilising the mobile station, authenticating the verbal password and, on receipt of an authenticated password from the said person, allowing the said person to establish communication with the receiving subscriber.

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25 9. A method as claimed in claim 8, characterised in that, the method includes the steps of switching a call from a mobile station to speech recognition means, causing a connection to be established between the speech recognition means and the mobile station, the speech recognition means establishing verbal contact with, and requesting a password from, the person making the call and, on receipt of the

verbally transmitted password from the said person, comparing the password with a stored password for the said person, authentication of the password allowing the said person continued communication.

5 10. A method as claimed in claim 9, characterised in that, the switching of the call to the speech recognition means is effected on initiation of a call from the mobile station.

10 11. A method as claimed in claim 9, characterised in that, the switching of the call to speech recognition means is effected when certain predetermined services are selected by the person making the call from the mobile station, the method including the step of storing the numbers sent out from the mobile telephone of the person making the call
15 pending authentication of the password of the calling person.

12. A method as claimed in claim 11, characterised in that, the predetermined services include certain routing zones and/or international telephony.

20 13. A method as claimed in claim 9, characterised in that, connection to the speech recognition means is only effected when the person making a call from a mobile station requires the use of certain predetermined functions in the network, the method including the step of establishing
25 contact between the mobile station and the speech recognition means utilising a special directory number.

14. A method as claimed in any one of the preceding claims, characterised in that, the method includes the steps of authenticating the number of the mobile station as

well as the verbally transmitted password from the person making the call.

5 15. An authentication method for an analogue mobile telephone system substantially as hereinbefore described with reference to the single figure of the accompanying drawings.

10 16. An analogue mobile telephone system comprising mobile stations, base stations and control units for establishing communication between a person who utilises the mobile station and a receiving subscriber, characterised in that, authentication of said person is effected by a method as claimed in any one of the claims 8 to 15.

Relevant Technical Fields

(i) UK CI (Ed.) H4L (LDSK, LECTS)
 (ii) Int CI (Ed.6) H04Q 7/32, 7/38

Search Examiner
 MR N HALL

Date of completion of Search
 17 JANUARY 1995

Databases (see below)

(i) UK Patent Office collections of GB, EP, WO and US patent specifications.

Documents considered relevant following a search in respect of Claims :-
 1-16

(ii) ON-LINE: WPI

Categories of documents

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A: Document indicating technological background and/or state of the art.	&: Member of the same patent family; corresponding document.

Category	Identity of document and relevant passages	Relevant to claim(s)
Y	EP 0481714 A2 (VODAFONE) see abstract	8 at least
Y	EP 0444351 A (AMTT) see abstract	8 at least
Y, P	WPI Abstract Accession No 94-268219/33 and JP 060197157 (TOSHIBA) (see abstract)	8 at least

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